

421 DEGREES BELOW ZERO IN SACRAMENTO

When U. S. astronauts zoom off to the moon, the force that will send them will be liquid hydrogen and liquid oxygen.

Theoretically the ideal rocket fuel, liquid hydrogen is stored at 421 degrees below zero Fahrenheit, which is 321 degrees below the coldest reading ever taken in the Arctic.

A new \$20 million plant, the largest of its kind in the free world, is scheduled to begin producing liquid hydrogen in January, 1964 near Sacramento, California. The plant has been built by Union Carbide Corporation's Linde Division under a 7-year, \$85 million liquid hydrogen supply contract with the National Aeronautics and Space Administration.

The new plant will produce 60 tons of liquid hydrogen per day to meet the fast growing requirements of West Coast aerospace programs. This is double the output of Linde's facility at Ontario, California, which has been the largest liquid hydrogen producer in the United States.

Located on a 56-acre site southeast of Sacramento, Linde's new plant will use more than 14,000,000 cubic feet of natural gas a day as a raw material. This is sufficient to supply all of the natural gas needs of a city the size of Richmond, California, with more than 71,000 persons and many industries.

The process consists of extracting the hydrogen from natural gas by means of a heat reformer cycle of high temperatures and high pressures. Natural gas is a mixture of several hydrocarbons, chiefly methane, whose molecule is made up of three atoms of hydrogen and one of carbon. The hydrogen product is further purified and liquefied by refining and refrigeration. It is then transferred to a 200-ton storage sphere where it is held at minus 421 degrees.

Most of the plant's output will go to nearby NASA rocket development projects being conducted by Aerojet-General Corporation and Douglas Aircraft Company.

Aerojet is developing the 1.2 million pound thrust M-1 rocket engine and Nerva, the nation's first nuclear powered rocket engine. The M-1 engine is expected to power upper stages of manned space vehicles for interplanetary flights beyond the moon. Douglas is working on the S-IV second-stage Saturn vehicle and the S-IV-B upper stage of the Saturn, both utilizing liquid hydrogen-liquid oxygen systems.

The Sacramento plant will be the third liquid hydrogen plant built by Linde in California. The company's plant at Torrance, first privately owned and operated liquid hydrogen plant in the U.S., has been supplying NASA projects since mid-1960. The Ontario plant has been producing 26 tons daily since June, 1962.

Before man-made machines venture into outer space, they must be subjected to the extreme environmental factors they will encounter. Missile and satellite systems are exposed in outer space to wide variations in temperatures: minus 440° F. on the side away from the sun and several hundred degrees above zero on surfaces exposed to direct solar radiation.

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Since the vacuum of space is extreme — up to a million-billion times greater than the highest vacuum produced by conventional, earth-bound equipment, familiar piston engines and turbojet engines fail totally because they run out of air. Thus rockets are the only propulsion means available for driving through the space vacuum. All upper-stage space missions are to be handled with liquid oxygen-hydrogen.

SIGMA TAU

ENGINEERS WANTED OVERSEAS BY PEACE CORPS

The Peace Corps estimates that more than 400 Engineers will be required during 1964 to meet the requests coming to it from the 48 countries throughout Latin America, Africa, and Asia where it now has projects.

At least one half of these Engineers would serve as operating personnel on various engineering projects where the types of engineering skills requested are in the following order: Civil, Agricultural, Mechanical, Electrical, Sanitary, Radio, and Industrial. The other half of the Engineers requested would fill teaching posts in various colleges, universities, and technical schools.

These requests come from many countries, but chiefly from the following: Brazil, Colombia, Ecuador, India, Malaya, Pakistan, Peru, Sierra Leone and Thailand.

Engineers who can take a temporary leave of absence from their present employment, as well as those planning early retirement, are invited to apply for one of these interesting overseas posts. Full details and an application form may be secured by writing to the Division of Recruitment, Peace Corps, Washington, D. C. 20525. Letters should indicate whether interest is in making an application on a temporary leave basis or as a retiree.

SIGMA TAU

MONKEY BUSINESS

Once upon a time, as an old Arabian legend has it, there were two cats who could not agree on a fair division of a chunk of tasty cheese. After a lot of argument, one said: "Let's go to the all-wise monkey and let him divide our cheese fairly."

So, they went to the monkey and agreed to abide by his judicial decision. The monkey broke the cheese into two parts and put the pieces on his judicial scales.

He found that one piece was slightly heavier than the other, so he nibbled a piece of it and put it again on his scale. He then found that it was lighter than the other, so he shrewdly bit off a piece of the other, only to find that there was still an imbalance.

While the two anxious cats watched this judicial performance, the monkey kept biting off pieces of the cheese, first from one piece and then from the other, until, eventually, there were only two small pieces remaining.

"What is left," said the monkey, as he popped them into his mouth, "is just enough to pay my fee."